Space Weather Technical Forecast

Issued on Wednesday, 08 November 2023 at 01:11 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Risk of G1/Minor Geomagnetic Storms declining but Active fluence (1e8 integrated pfu) expected in the coming days. Chance of isolated M-class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Low with only C-class flares in the last 24 hours. There are five numbered and one unnumbered sunspot region on the visible disc. The largest region remains AR3477 which continues to be fairly stable. AR3479 in the northwest has seen development in recent hours, now Dri/Beta-Gamma, and will be monitored closely. AR3483, now Cri/Beta-Gamma, has also seen multiple spots emerge in recent hours with a complex north-south magnetic structure developing, likely increasing the flare risk from this region in the coming hours/days. The remaining regions remained stable.

No Earth directed CMEs have been observed in available imagery.

Solar Wind / Geomagnetic Activity: Solar winds at L1, as observed by DSCOVR and ACE, showed the continued impact of the high speed stream (HSS) associated with CH67/-. Wind speeds were strong, generally 650-700 km/s. Density was at below average levels. Total magnetic field strength (Bt) showed a slowly rising trend, but remained weak. The north-south component (Bz) varying only weakly. Phi angle has been predominantly negative (towards the Sun), with just a few brief variations. Geomagnetic activity has been generally Quiet to Unsettled (Kp 2-3), but with a G1/Minor Storm (Kp 5) interval 07/0000-0300UTC, as observed by BGS.

Energetic Particles / Solar Radiation: GOES16 high energy (greater than 10MeV) proton flux has been at background levels over the last 24 hours. GOES16 high energy (greater than 2MeV) electron flux was at moderate levels initially, but rose to occasionally high levels from 08/1200 UTC. The associated 24-hour fluence has been well below the Active threshold (1e8 integrated pfu) initially but has risen quickly through the period. The fluence observation at 08/0000 UTC was 4.57e7 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Generally Low solar activity is expected through the period, but with a chance of isolated M-class flares.

Solar Wind / Geomagnetic Activity: No CMEs currently forecast to reach Earth. Solar wind speeds are at strong levels, around 650 km/s, due to the HSS from coronal hole CH67/-. Elevated to strong wind speeds are likely to continue through Day 1 into Day 2 (8-9 Nov), before a gradual decline through Days 3 and 4 (10-11 Nov).

Geomagnetic activity expected to be generally Unsettled initially, with a slight chance of further isolated G1/Minor Storm intervals on Day 1. This risk reducing into the period with activity expected to gradually decline through the following days as the HSS eases to generally Quiet

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levels.

Energetic Particles / Solar Radiation: High energy (greater than 10MeV) proton flux is most likely to remain at background levels. High energy electron flux (greater than 2MeV) is currently at moderate to high levels and expected to remain so through the remainder of the period. Associated 24-hour electron flux is expected to be just below the Active threshold at first, but with an expectation of fluence exceeding the Active (1e8 integrated pfu) threshold by later day 1 (8 Nov) and remaining so through the remainder of the period, with a slight but increasing chance of reaching 1e9 integrated pfu.

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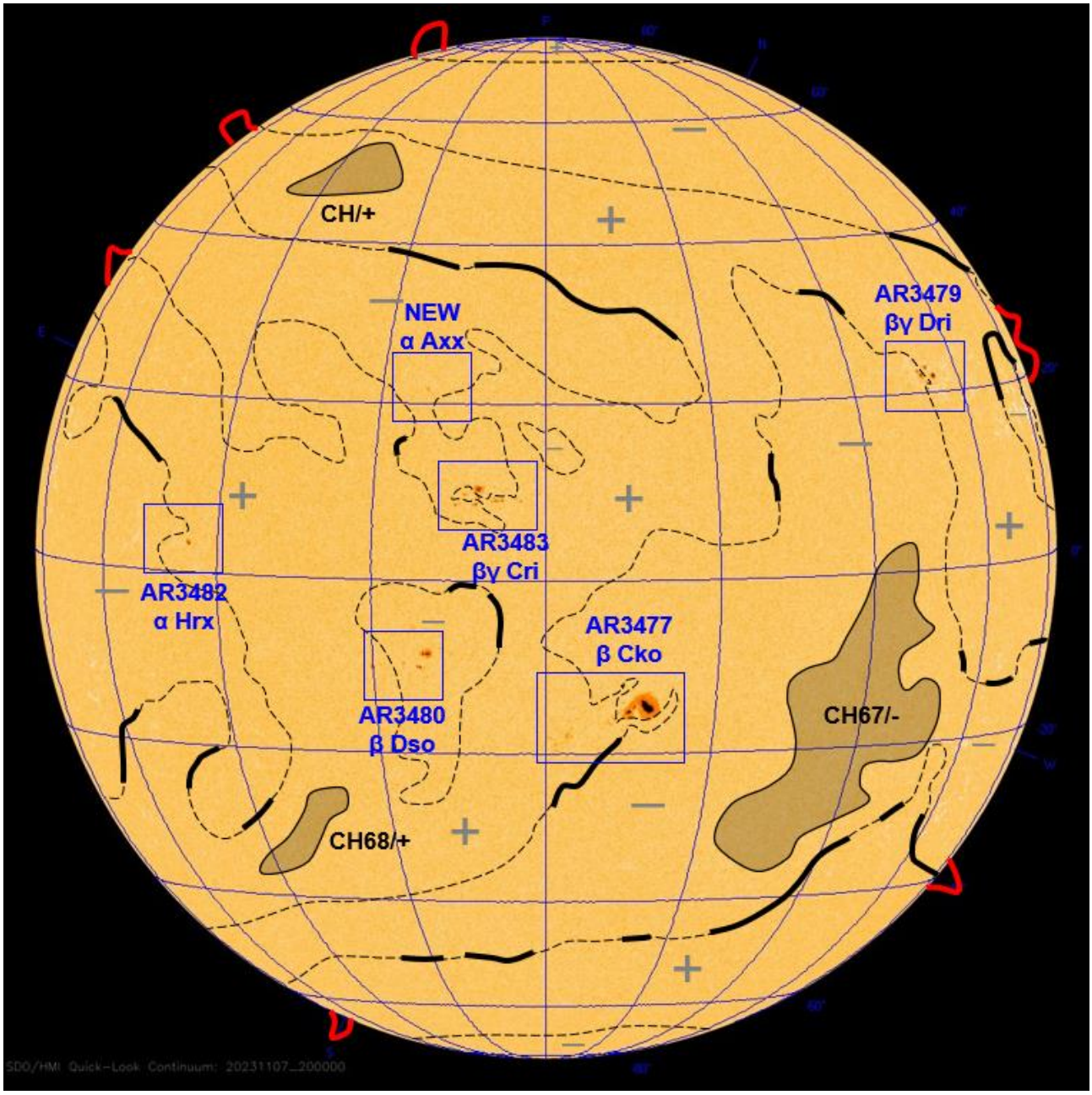
Figure 1. Solar Analysis Valid 07/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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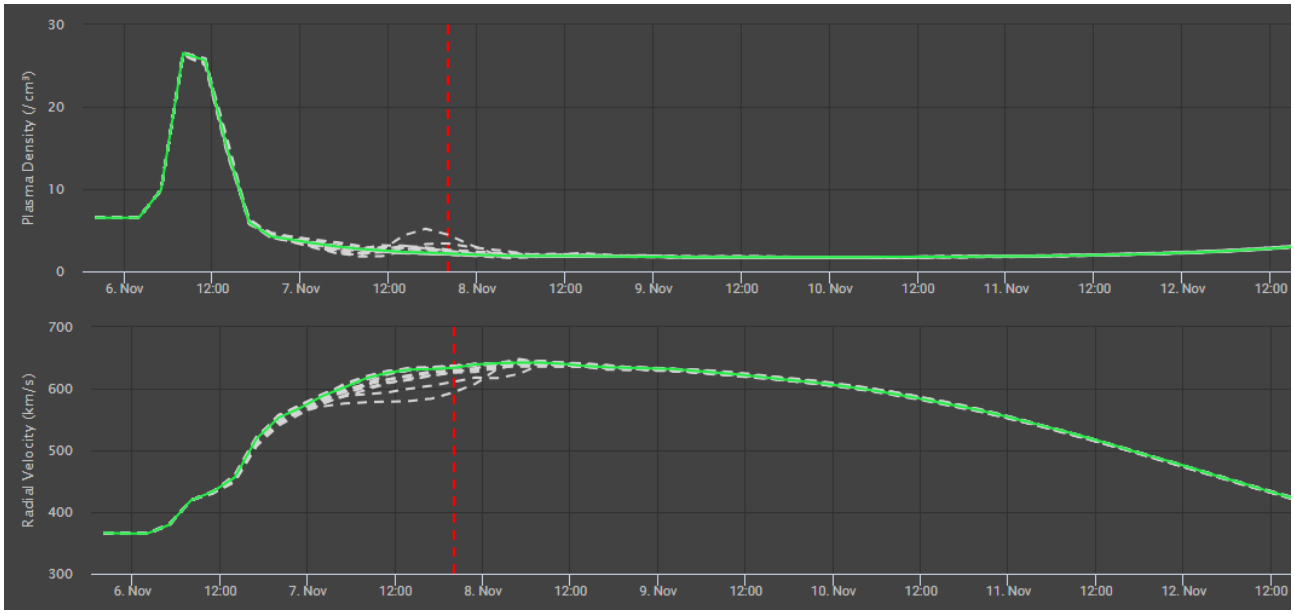
Geomagnetic Storms:

No Earth directed CMEs are currently forecast.

Solar wind speeds are at strong levels, around 650 km/s, due to the ongoing influence of a HSS from coronal hole CH67/-. These winds are expected to continue at elevated to strong levels through days 1 and 2 (8-9 Nov) before beginning to decline from day 3 (10 Nov) onwards. MOSWOC ENLIL modelling viewed a providing reasonable guidance for the coming period. Geomagnetic activity expected to be generally Unsettled initially, with a slight chance of further isolated G1/Minor Storm intervals on Day 1. This risk reducing into the period with activity expected to gradually decline through the following days as the HSS eases to generally Quiet levels.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	20	10	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: Latest MOSWOC ENLIL Ensemble output.



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Met Office Space Weather Technical Forecast

Radio Blackouts - X-Ray Flares:
Activity has been Low with only C-class flares in the last 24 hours. Generally low activity expected to continue but with an increased chance of isolated M-Class flares given recent developments in both AR3479 and AR3483, along with the continued threat presented by the larger AR3477 near centre disk and the previously active AR3480. No further large regions due to rotate into the visible side of the Sun during the period, with only AR3479 due to leave the disk.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X Class	No	5	5	5	5

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Solar Radiation Storms - (High Energy Protons):
The high energy (greater than 10MeV) proton flux observed by GOES16 is expected to persist at background levels. There is a slight risk of proton enhancement from any larger flares.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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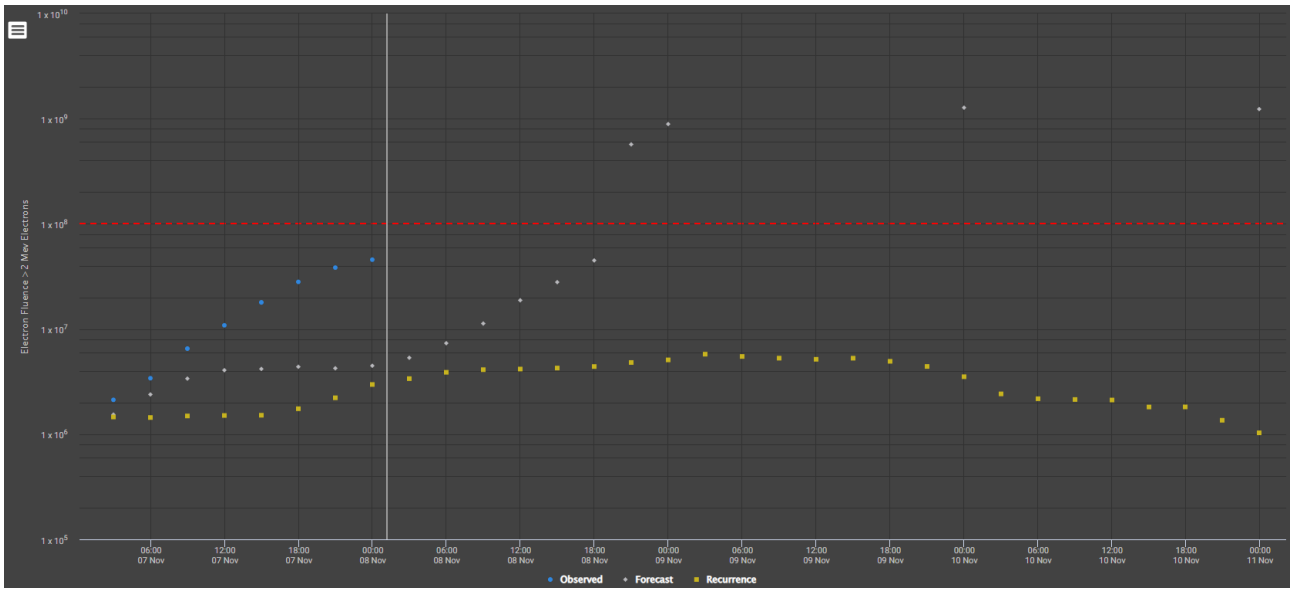
High Energy Electrons Event (≥ 2MeV):
High energy electron flux (greater than 2MeV) has risen to moderate to high levels, following an expected flux increase in the radiation belt after the recent CME and ongoing HSS, with high levels expected to continue as effects continue to ease.

Associated 24-hour electron flux is expected to be just below the Active threshold at first, but with an expectation of fluence exceeding the Active (1e8 integrated pfu) threshold by later day 1 (8 Nov) and remaining so through the remainder of the period, with a slight but increasing chance of reaching 1e9 integrated pfu. Latest MOSWOC REFM model is viewed as providing good guidance over the coming days.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	80	90	90	90
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	5	15	20

Figure 3: Latest MOSWOC REFM model output.



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